THE ONTARIO WATER RESOURCES COMMISSION

REPORT ON WATER AND SEWAGE TREATMENT AND POLLUTION CONDITIONS

IN THE

TOWN OF PICTON

IN THE

COUNTY OF PRINCE EDWARD

DIVISION OF SANITARY ENGINEERING

DISTRICT ENGINEERS BRANCH

1972

Water management in Ontario

Ontario
Water Resources
Commission

Kingston
Regional Office

275 Ontario Street,
Kingston, Ontario.
Tele. 546-3171

March 30, 1972

Mr. A. M. Jarvis,
Clerk-Treasurer,
Town of Picton,
Box 1670,
Picton, Ontario.

Dear Mr. Jarvis:

Re: Town of Picton
Report on Water and Sewage Treatment
and Pollution Conditions in the Town
of Picton

We are pleased to submit a report on a survey of the Water Filtration Plant, Water Pollution Control Centre and surface water quality conditions in the Town of Picton, together with the results and recommendations of our investigations. The recommendations are as follows:

1. As more connections are made to the water distribution system, consideration should be given to increasing the present storage capacity.

2. According to the OWRC Drinking Water Objectives, a minimum of 15 bacteriological samples should be collected each month from the distribution system. The Town of Picton Public Utilities Commission conscientiously collect a number of these samples each month and we anticipate that they will ensure that the suggested 15 are collected and submitted to the OWRC laboratory or the Department of Health laboratory in Kingston.

3. In-depth studies for alleviating excessive infiltration should be undertaken. In this regard, the weeping tile along with roof connections should not be allowed to hook into the sanitary sewer system.

4. To assist the operator in controlling the solids concentration in the "contact zone" and "reaeration zone" it is recommended that a centrifuge be acquired.

..... 2

5. The organization and adoption of a plan to eliminate the discharge of untreated waste to the storm sewers and storm drainage ditches should be undertaken by the Town of Picton. Under the plan a house to house examination would be required and each link to the storm sewer system would then be proved out and systematically eliminated if required. Bacteriological sampling and dye testing to find the sources of pollution would assist during the investigation.

After council has had an opportunity to review the report, we would be pleased to meet and discuss at their convenience any points that have risen.

Yours very truly,

L. G. South, P. Eng.,
District Engineer,
Div. of Sanitary Engineering.

RAD/lc

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INTRODUCTION

Throughout 1971, staff of the District Engineers Branch, Ontario Water Resources Commission, endeavoured to study the water supply system, waste treatment and collector system and the surface water conditions in the Town of Picton. The specific objectives of the study were as follows:

1. Make an appraisal of the present water supply system and relate its effectiveness for the future.
2. Make an appraisal of the present sewage facilities and to assess the capacity of the system to meet future demands.
3. Locate sources of existing and potential sources of pollution. The effect of waste discharges on Picton Creek and Picton Bay were also included in the study.
4. Recommend action that is required to alleviate the pollution problems.

Advice, assistance and generous contributions to the study were provided by the following:

Mr. H. Seely, Hastings and Prince Edward Counties Health Unit.

Mr. H. C. Blakely, Manager, Public Utilities Commission.

Mr. L. Tolley, Foreman, Public Utilities Commission.

Mr. C. McConnell, Town Foreman.

Mr. G. Dingman, Operator, Waste Treatment Plant.

Mr. A. M. Jarvis, Clerk, Town of Picton.

LOCATION AND BRIEF HISTORY

The Town of Picton is picturesquely located at the head of the Bay of Quinte. Being one of the oldest towns in the province, it has enjoyed an interesting and varied history and from the earliest days of settlement has served as an important marketing and community centre. As well as serving the agricultural communities, it plays host to many tourists who come to Prince Edward County seeking rest and recreation.(1)

Transportation to and from the town is mainly dependent upon the major highways of # 49 and #33.

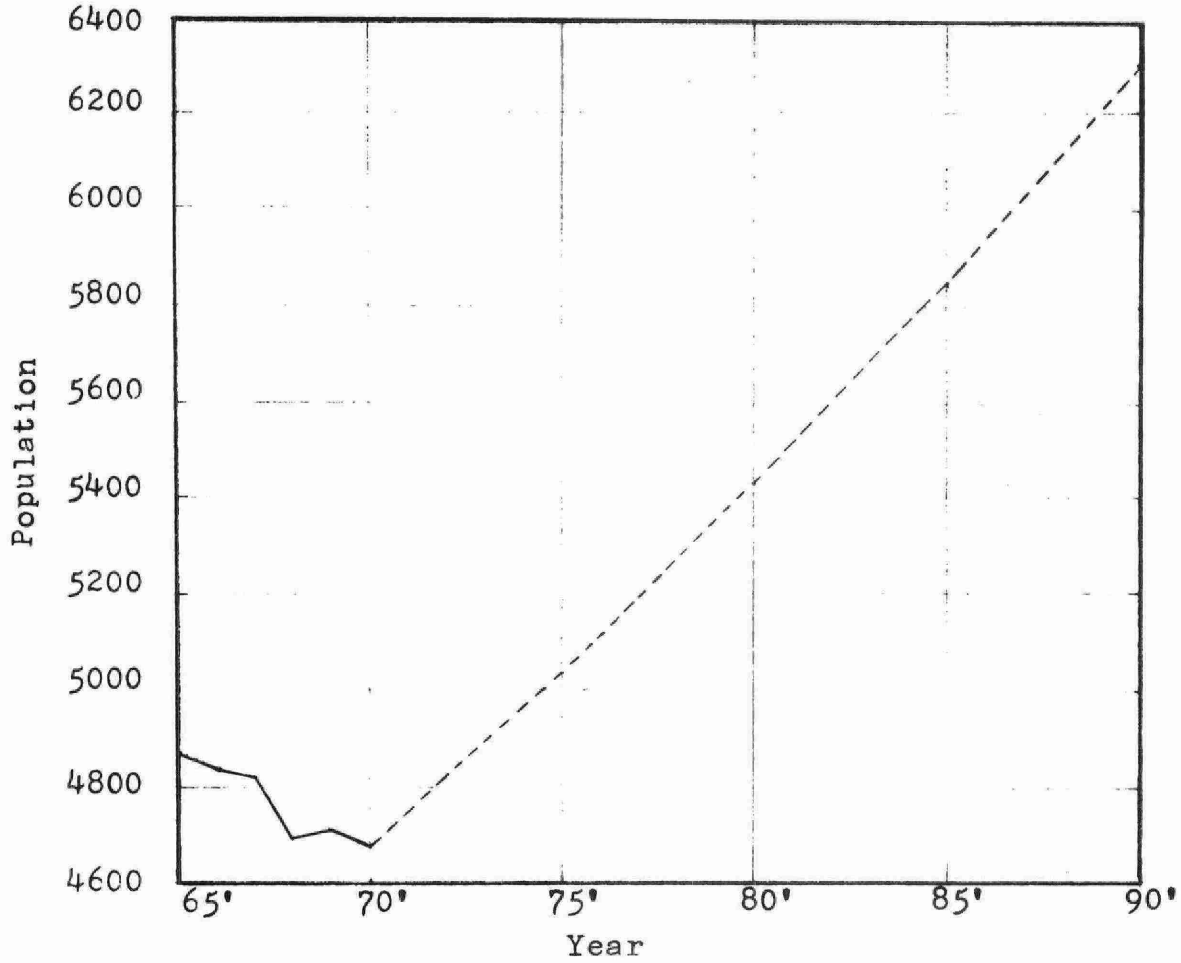
TOPOGRAPHY AND SOIL CONDITIONS

In the Town of Picton the topography is rolling to steep and the Picton esker with an altitude of 450 feet in the cemetery declines to 300 feet at its southeast end. The esker is characterized by materials of coarse sand to cobbly gravel which results in good to excessive drainage. In the north west end of the town, the topography is slightly undulating. The soil, covering fractured limestone in this area, is shallow.

POPULATION

The population of Picton has fluctuated substantially over the past ten years between 4675 and 4875. The Canadian Forces Station in Hallowell Township now being operated as a Hospital Complex by the Ontario Department of Health has had quite an influence on this fluctuation. The present population is 4676, while the population in 1961 was 4739 and in 1965, 4866.

FIGURE 1 - TOWN OF PICTON PROJECTED POPULATION TO YEAR 1990



As shown in Figure 1, assuming a nominal population growth of 1.5% annually, the population in 1990 will be 6298.

WATER SUPPLY SYSTEM

Introduction

The Water Purification Plant is located at the foot of Spencer Street. The management and operation of the facilities is the responsibility of the Public Utilities Commission under the general supervision of Mr. C. Blakely, Manager. Day to day operation and maintenance is the responsibility of Mr. L. Tolley, Foreman of the Public Utilities Commission.

Existing Water System

The main plant components are summarized below:

-Intake: 16" intake pipe extending 1000 feet into Picton Bay
16" emergency intake pipe, 300 feet long, terminating in 8 ft. depth of water.

-Intake well and low lift pumping chamber 15'x6'x12' deep.

-Low lift pumps: two vertical type 700 gpm capacity pumps at 25' head and driven by a 7.5 HP motor.
One pump has a right angle drive to a gasoline engine.

-Coagulation basin: Eight tanks each 7'x7'x12.5'deep.

-Settling tanks: Two settling tanks 75'x15'x12.5' deep.
Total capacity 175,780 gallons.

-Chemical Feeders: alum, carbon, fluoride and pre and post gas chlorination.

-Filters: Two gravity filters each 13' x 13'
Total capacity approximately 1.0 M.G.D.
Three pressure filters 8' diameter and 20' long. Total rated capacity 1.0 M.G.D.
All filters have anthrafilt media.
Total filter capacity 2.0 M.G.D.

-Clearwell: Capacity 300,000 gallons.

-High Lift Pump:

1. Allis Chalmer centrifugal pump with a rated capacity of 1000 gpm.
2. Fairbanks Morse centrifugal pump with a rated capacity of 750 gpm.
3. Reese centrifugal pump with a rated capacity of 320 gpm.
4. Fairbanks Morse centrifugal pump with a rated capacity of 1400 gpm driven by a diesel engine.

-Metering: High lift pumpages measured by a BIF recording and totalizer meter.

Figure 2, drafted by Mr. Blakely in 1968 shows the existing plant components.

Existing Distribution System and Storage

Figure 3, shows the existing water system in the town. The 14" spine main from the filtration plant through the main section of the town and eventually to the 1 M.G.D. reservoir in Hallowell Township provides adequate distribution to the domestic, commercial and industrial sections. The system is furtner strengthened by means of a 10" main which runs along Hill Street from the filtration plant. As noted in Figure 3, the largest main in the system is 18" while the smallest is 1". The approximate distribution of the mains under 6" is as follows:

Diameter	Total Feet
4"	12,450
2" and under	23,500

As a result of the extensions in 1971, water mains are now extended 7013 feet west of the town limits along Highway 33 and 5666 feet to the east of the town limits. In addition, an 8 inch main along Highway # 49 provides water for the hamlet of Fawcettville and the Prince Edward County Home. From the reservoir in Hallowell Township, water is conveyed to the Ontario Department of Health Hospital Complex.

Water storage is provided by the 0.30 M.G. clearwell beside the water filtration plant and a 1.0 M.G. reinforced concrete reservoir located in Hallowell Township (near the Ontario Department of Health Hospital Complex).

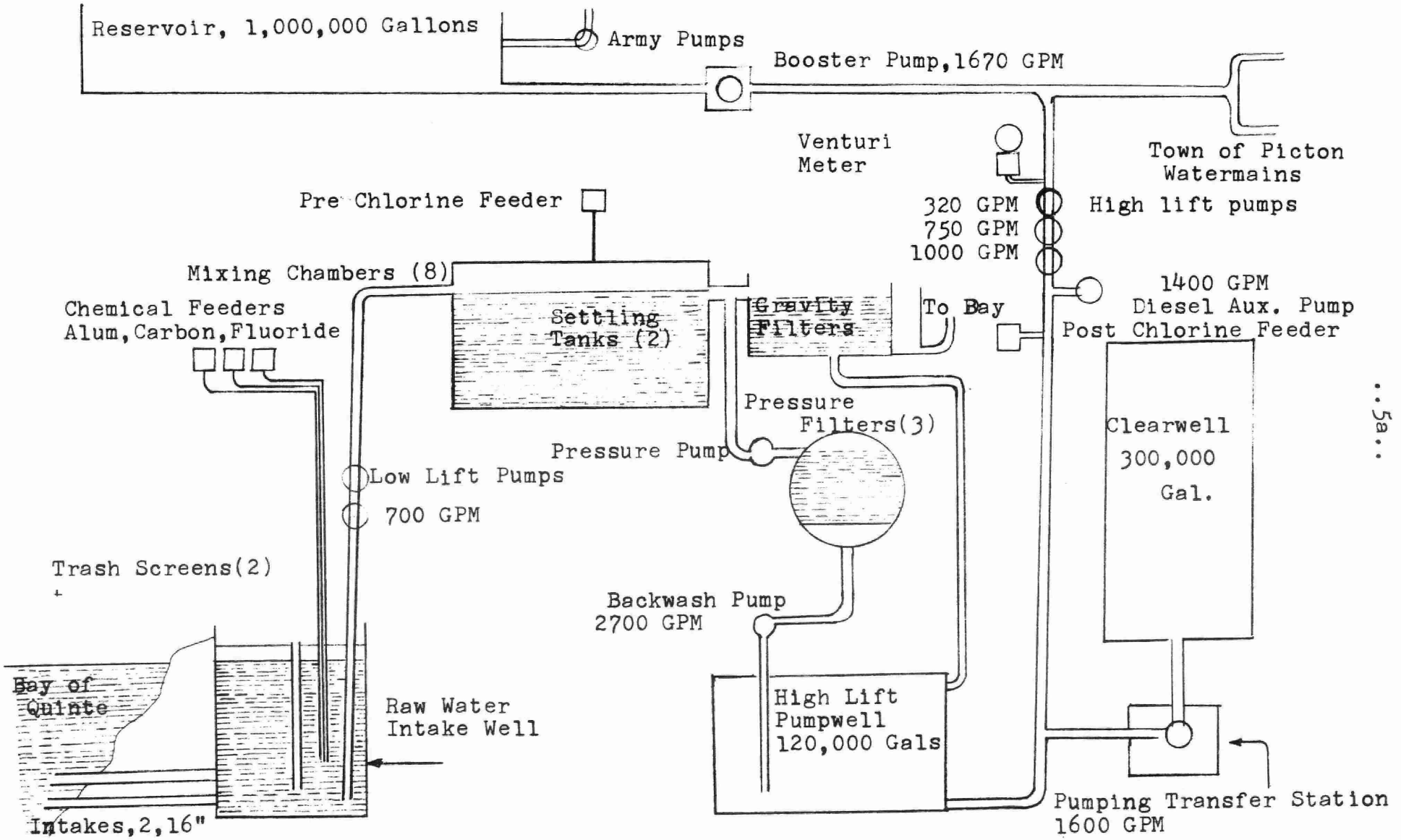


Figure 2. PICTON WATER PURIFICATION PLANT FLOW DIAGRAM

Drawn by: H.C. Blakely,
Picton PUC
February 26, 1968

..5a..

For a municipality serving over 5000 persons, the following is suggested when determining the storage requirements.

(a) 75% of the Canadian Underwriters Association requirements.

$Q = 850 \sqrt{P} \ (1-0.01 \sqrt{P} \times \text{fire duration (8 hrs)})$

where Q is flow in gallons

P is population in thousands

(b) 25% of maximum day

(c) 25% of the sum of (a) and (b)

(a) $Q = 850 \sqrt{5.1} \ (1-0.01 \sqrt{5.1} \times 480 \times .75)$

$Q = 677{,}900$ gallons

(b) $0.25 \times 1{,}522{,}000 = 380{,}000$ gallons

(c) $(677{,}900 + 380{,}000) \times 0.25 = 265{,}000$ gallons

Total storage required

677,900

380,000

265,000

1,322,900 gallons.

Since the present storage capacity totals 1,300,000 gallons, the above criteria is generally being met. In the future however, the need for additional storage should be considered. Using the same criteria as above approximately 1,530,000 gallons of storage would be required in 1990.

Water Pumpages

The following summarizes typical water consumption figures for 1970.

TABLE ONE - WATER PUMPAGES AT THE TOWN OF PICTON WATER PURIFICATION PLANT - 1970

	PUMPAGES - M.G.D.		
Month	Total	Average Day	Maximum Day
January	19.446	0.627	0.723
February	18.278	0.653	0.753
March	17.586	0.567	0.728
April	18.105	0.604	0.722
May	18.076	0.583	0.687
June	26.458	0.882	1.282
July	22.731	0.733	1.045
August	32.316	1.042	1.522
September	21.316	0.711	0.863
October	18.176	0.586	0.750
November	17.251	0.575	0.700
December	18.036	0.582	0.677
Total	247.775		
Population served within municipality			4767
Population served outside municipality			472
Total population served			5148
Average day in year 0.679 M.I.G.D.			132 gpcd
Peak day 1.522 M.I.G.D. (Aug 14/70)			296 gpcd
Average day in peak month 1.041 MI.G.D. (August)			202 gpcd

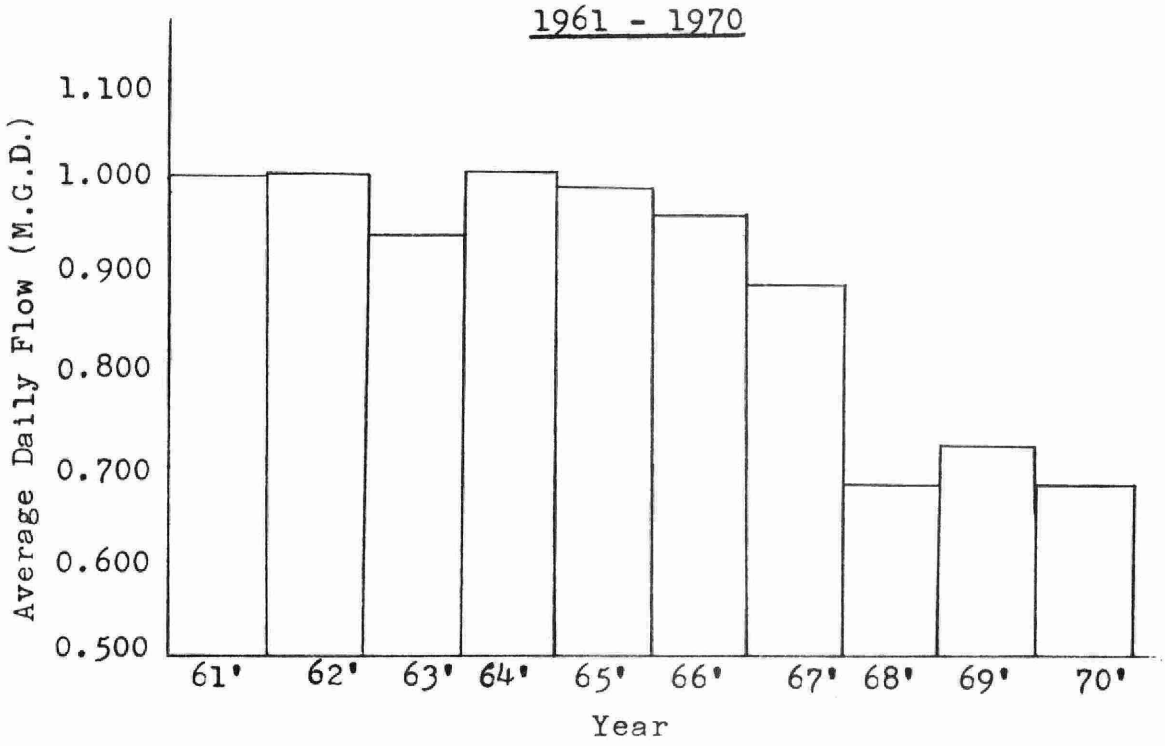
TABLE ONE (A)

WATER PUMPAGES AT

TOWN OF PICTON

WATER PURIFICATION PLANT

1961 - 1970



Year	Average Daily Flow (M.G.D.)
1961	1.002
1962	1.030
1963	0.942
1964	1.038
1965	0.986
1966	0.969
1967	0.882
1968	0.683
1969	0.732
1970	0.679

Current peak daily consumption (1.522 M.I.G.D.) is 224% of present average daily consumption (0.679 M.I.G.D.). Therefore based on the following assumptions; a) the peak daily consumption factor is 230%, b) the average daily per capita consumption will not change, c) the population growth rate is 1.5%, it was then calculated that the present plant will meet the demands of the residents until the year 1990. This is illustrated in the calculation below:

Population Capable of Being Served with Present Plant

$$\frac{2{,}000{,}000 \text{ gallons}}{132 \text{ gpcd} \times 2.3} = 6588$$

Population of the Town of Picton in 1993 based on a 1.5% growth rate - 6586

The 1990 date was selected because the areas served in Hallowell Township were not included in the above calculations.

Evaluation of Treatment Processes

a) Introduction

Each of the unit treatment processes is looked at in some detail here to accurately assess its function towards the production of a good potable water.

b) Screening

The two intake screens located in the raw water intake well remove the larger suspended and floating materials. Ore boats delivering bulk material to the Lake Ontario Cement Limited premises in the summer months intermittently agitate the water in Picton Bay which results in heavy loads of silt, clay, and aquatic weed growths reaching the plant. During these periods the screens are cleaned very frequently.

c) Coagulation and Flocculation

Coagulation is achieved by adding aluminum sulphate to the clear well at an average rate of 19.4 ppm (1970). The entire process increases the opportunity for particle to particle contact so necessary for the formation of larger aggregates which subsequently will settle rapidly under the influence of gravity. The gentle and prolonged mixing which converts the coagulated particles into visible suspended solids is achieved by the eight mixing tanks. Normally, a good floc is achieved at the filtration plant.

d) Sedimentation

Using 1970 pumpages, the average and minimum retention times were calculated to be 6.2 hrs. and 2.8 hrs. respectively.

$$\frac{175,780 \times 24}{679,000} = 6.2 \text{ hours}$$

$$\frac{175,780 \times 24}{1,522,000} = 2.8 \text{ hours}$$

where average daily flow = 679,000 gallons

peak daily flow = 1,522,000 gallons

total capacity of sedimentation tanks = 175,780 gallons

In practice, detention periods vary considerably but common periods range up to eight hours with the usual range being from 1.5 to 3.5 hrs. Therefore, the present detention periods are adequate.

e) Filtration

Since the average daily flow is normally less than one million gallons, the operators find it more convenient to operate the gravity filters as opposed to the pressure filters. Over the period of a year, Mr. Tolley estimates the pressure filters would be used approximately 30% of the time.

Filter runs are terminated usually every 24 hours, however, if the head loss exceeds six feet or the filter water no longer meets a reasonable standard they are backwashed before the 24 hours have elapsed.

f) Taste and Odour Control

Several years ago, a sample of the algal mat on the screens was submitted to the OWRC laboratory for biological analysis. It was not surprising to find that the sample was dominated by the blue-green algae Aphanizomenon and Anobaena; the diatoms Fragilaria and Stephanodiscus and the filamentous green algae Spirogyra. These forms are capable of imparting a variety of tastes and odours to the water and usually develop from products of decomposition as the algae begin to die. (2)

Treating the odorous water with powdered carbon has generally resulted in the production of an aesthetically pleasing quality of water. Very few complaints are received by the operating authority related to taste and odours.

g) Pre and Post Chlorination

In 1970, considering the pre and post chlorination together, the average daily dosage was computed to be 3.64 ppm, sufficient to achieve a residual above 0.5 ppm in the treated water. The residual on top of the filters is usually maintained between 0.35 and 0.40 ppm. The chlorination treatment practices at the plant are good.

h) Fluoridation

Commercial hydrofluosilicic acid is used to fluoridate the water. Besides calculating the daily dosage the operators determine the fluoride concentration by using an absorption-meter and Spadns reagent. The following table summarizes the fluoride dosage for 1970.

TABLE TWO - FLUORIDE CALCULATED DOSAGE AT THE TOWN OF PICTON WATER FILTRATION PLANT - 1970

Month	Hydroflosilicic Acid Used (lbs)	Calculated Dosage ppm
January	737	0.76
February	743	0.81
March	848	0.96
April	862	0.95
May	856	0.95
June	1466	1.11
July	1100	0.97
August	1661	1.03
September	1035	0.97
October	975	1.07
November	896	1.04
December	922	1.02
Total	12,101 lbs	

Average calculated fluoride dosage 0.97 ppm

The above calculations were based on the reported information illustrated below:

Per Cent (%) fluoride in pure compound of hydrofluosilicic acid - 79.2

Per Cent commercial purity of hydrofluosilicic acid - 25.2

Number of pounds of pure fluoride in one pound of commercial grade hydrofluosilicic acid - 0.252 x 0.792 - 0.1996

Since the natural fluoride content ranges between 0.1 ppm and 0.3 ppm the average dosage in 1970 therefore exceeded 1.0 ppm but normally would not exceed 1.2 ppm. The Ontario Water Resources Commission recommends an operating range of 0.8 ppm to 1.2 ppm.

After the investigation of the fluoride treatment process by the operators and staff of the OWRC Technical Advisory Board, better control of the dosage was effected.

Water Quality

a) Physical

The colour of the raw water averages about 20 units while the turbidity averages approximately 7.0 units. After treatment the colour and turbity are usually reduced to less than 5 units and 2.0 units respectively.

b) Chemical

The water is chemically satisfactory.

c) Bacteriological

The geometric mean of the 42 raw bacteriological samples collected during 1970 was calculated to be 69 coliforms/ 100 ml. None of the 60 samples collected from the distribution system showed the presence of bacteria.

According to the OWRC Drinking WaterObjectives, a minimum of 15 samples should be collected each month from the distribution system when the population served is 5000. In addition, the frequency of the sampling intervals should be weekly. Therefore, in the course of a year, samples collected by staff of the OWRC, P.U.C. and the health unit should total 180.

Recently, the Town of Picton was included with the municipalities having the Presence-Absence test conducted on samples being submitted to the OWRC laboratory.

Summary

The Town of Picton Water Filtration Plant is capable of meeting the average and peak daily demands until the year 1990. At present, there is adequate storage, however, it should be noted that an additional 230,000 gallons storage system will be

required for the year 1990.

The plant is conscientiously maintained and operated.

WASTE TREATMENT AND COLLECTION

Introduction

The Town of Picton Water Pollution Control Centre is located on the east side of Picton Creek and south of York Street. The operation of the facilities is the responsibility of Mr. G. Dingman, Chief Operator. In 1970, the treatment facilities were made available to 4860 persons in the town and approximately 40 persons in the Township of Hallowell.

Existing Waste Treatment Facilities

In 1963, the trickling filter treatment process was abandoned and a Smith and Loveless contact stabilization treatment plant constructed. The plant was designed for an average daily flow of 0.54 million imperial gallons per day (MGD) and a wet weather flow of 1.62 M.G.D. The design 5-day BOD and suspended solids loadings were 1,100 lbs/day and 1,300 lbs/day respectively.

Preliminary treatment consists of bar screens, air degritter, and a comminutor.

After comminution the raw sewage flows to the "contact zone" or aeration area where the raw sewage is intimately mixed with the conditioned activated sludge discharging from the "reaeration zone". The capacity of the "contact zone" is 38,900 gallons which provides a retention of 1.73 hours at the design flow of 0.54 mgd.

From the contact zone the flow is conveyed to the settling tanks. The sludge settles to the bottom of the tanks where the sludge collector mechanism moves the material to the

centre from which it is withdrawn to the "reaeration zone". The effluent from the final settling tanks is then carried to the chlorine contact chamber where disinfection is accomplished. The sludge drawn from the bottom of the settling tanks is aerated for 8.9 hours (at design flow) as it flows through the "reaeration zone" (capacity of reaeration tank 200,700 gallons) toward the "contact zone". During the reaeration period, the organic material absorbed and adsorbed by the activated sludge in the "contact zone" is digested and assimilated so that at the outlet of the compartment the sludge is ready to be mixed with a fresh load of raw sewage in the "contact zone".

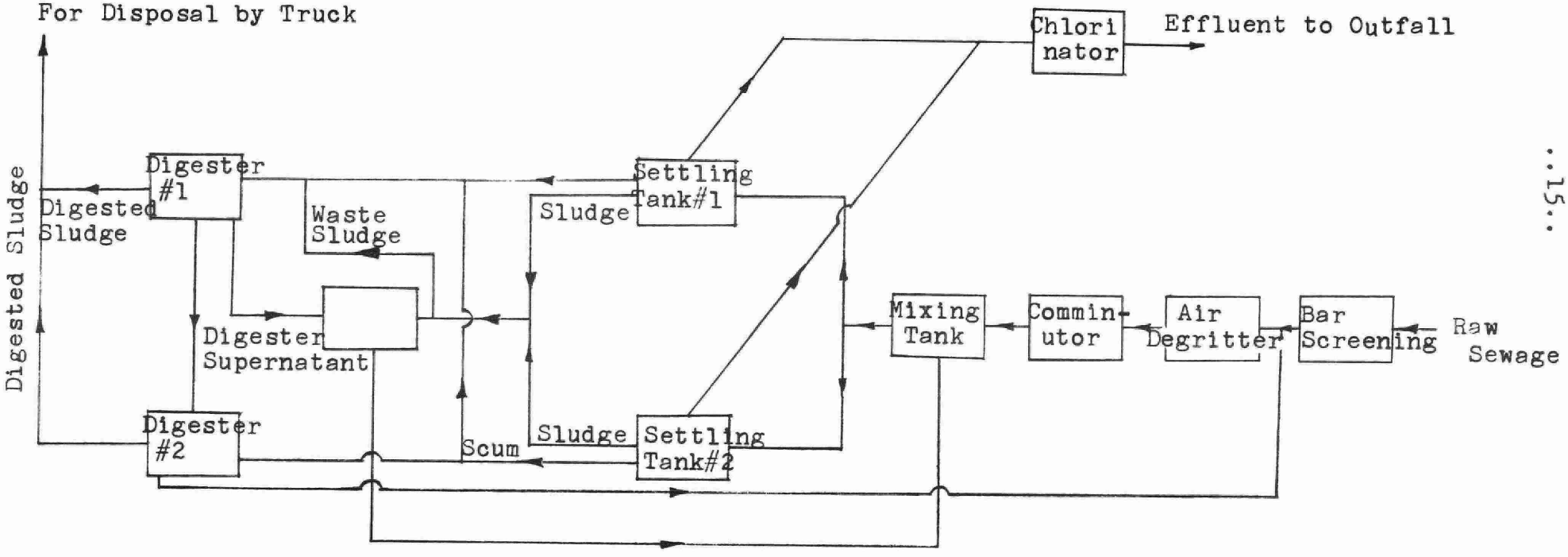
Final settling is provided normally by one of the two 40 foot diameter concrete tanks. For one tank at design flow, the retention period is 3.5 hrs.; the surface settling rate is 430 gpd/sq. ft.; weir discharge rate is 4,300 gpd/linear ft/day. Normally the return sludge is pumped to the reaeration section continuously but periodically part of the activated sludge is returned to the aerobic digester compartment.

Digestion of the wasted sludge is carried out in two aerobic tanks which are operated in series. The # 1 digester is 32 ft. in diameter and a 13 ft. liquid operating depth. The # 2 digester is 28 ft. in diameter with a liquid depth of 21.0 ft. The digesters provide a total of 3.6 cu. ft. of storage per capita. The two stage digestion is followed by tank truck disposal of the stabilized sludge to nearby agricultural land.

The chlorine contact chamber with a capacity of 7500 gallons provides a 20 minute retention period at design flow.

DIAGRAM ONE

SYSTEM DETAIL DIAGRAM OF THE CONTACT STABILIZATION PLANT AT THE TOWN OF PICTON



FLOW DIAGRAM

Flow Diagram obtained from Reference Three.

Existing Sanitary Sewer Collector System

The overall sewer collector system for the Town of Picton is shown in Figure 4. To provide services throughout the town and yet convey all waste to the treatment plant, it was necessary to construct three pumping stations which have been designated as the East End, Hill Street and Bridge Street Pumping Stations. The area served by these stations is summarized below:

Pumping Station	Area Served
East End	Station located outside the northerly town limits on Hwy # 49. Premises served include one or two homes and the Prince Edward County Home for the Aged on the highway.
Hill Street	Area served includes the section north of Johnston Street and south of Main Street. This of course includes sewage from the Hill Street Pumping Station. A 6-inch forcemain conveys waste from the pumping station to the corner of Fairfield St. and Main St.
Bridge Street	All sewage from Hill Street pumping station, west of Main Street and north of York Street, is transferred to this main pumping station. Two pumps at the station transfer the sewage through an 8-inch diameter forcemain to Head Street and from this point it flows by gravity to the Waste Treatment Plant.

Waste originating south of Chapel Street and east of Main Street is conveyed directly to the plant. Similarly, sewage collected along York Street flows by gravity directly to the treatment plant.

In 1971 approval was given by the OWRC for the construction of sanitary sewers and a pumping station to serve the area along Bridge Street north and Philip Street.

Storm Sewer Collector System

Figure 5 illustrates the storm drainage pattern for the municipality. As noted all drainage is conveyed either to Picton Creek or the Bay. The plan indicates that approximately 20% of the municipality is served with storm sewers, yet there are no combined sewers since the remaining runoff flows to the open ditches.

Evaluation of Pumping Stations and Overflows

Since there is usually an overflow at most pumping stations, it was considered necessary to review the system considering the total pumping capacity at the pumping stations, infiltration, frequency of overflows and the degree of pollution provoked by the overflows.

1) East End Pumping Station

The Smith and Loveless Pumping Station equipped with two pumps rated at 250 gpm each was constructed to mainly serve the Prince Edward County Home for the Aged. When the flows began to substantially exceed the water pumpages to the home it became apparent that vast quantities of ground and surface runoff were entering the sanitary sewer collector system along the highway. In fact, there were times when the station was pumping

greater than 100,000 gpd and comparing this with the average daily water pumpage to the home (4800 gpd) the severity of the infiltration is realized.

In 1970 and 1971, the sewer line was inspected by Underwater Tel Eye of Canada to determine the extent of degradation. Sealing of the cracks and leaking joints was subsequently carried out but the success of the works has not been entirely assessed as of this date. It is hoped, however, that the program will be successful.

The writer did not find any overflow from the pumping station and when checking with the town officials it was reported that there was none.

2) Hill Street Pumping Station

This pumping station is equipped with two Smart and Turner pumps rated at 200 gpm and 300 gpm respectively. Overflows at the station trickle down over the steep bank eventually terminating in Picton Bay.

On March 15, 1971 when the station was being inspected by the writer, in company with Mr. Dingman, an overflow was occurring. The results of a chemical and bacteriological sample collected at the time are presented herewith.

TABLE 3 - SAMPLE RESULTS OF THE HILL STREET PUMPING STATION OVERFLOW

Station	5-day BOD ppm	Susp. Solids ppm	Chloride as Cl. ppm	Phenols as ppb	Total Coliforms 100 ml.	Fecal Coliforms 100 ml.
Hill St. Overflows	32	110	62	40	G 80,000	G 8,000

G - Greater than

Such a discharge to the bay will have a deleterious effect on the quality of water. In addition, it certainly was objectionable to see rags, paper, etc. being discharged from the station and being scattered all along the bank. To enhance water quality in the bay and also make the area around the station aesthetically pleasing measures should be taken to eliminate or minimize the overflows. It is understood that the town has already taken action in this regard. For the time being, a screen should be constructed around the outlet pipe or in the wet well to prevent the access of larger particles to the bay. This of course will necessitate frequent cleaning by the operator.

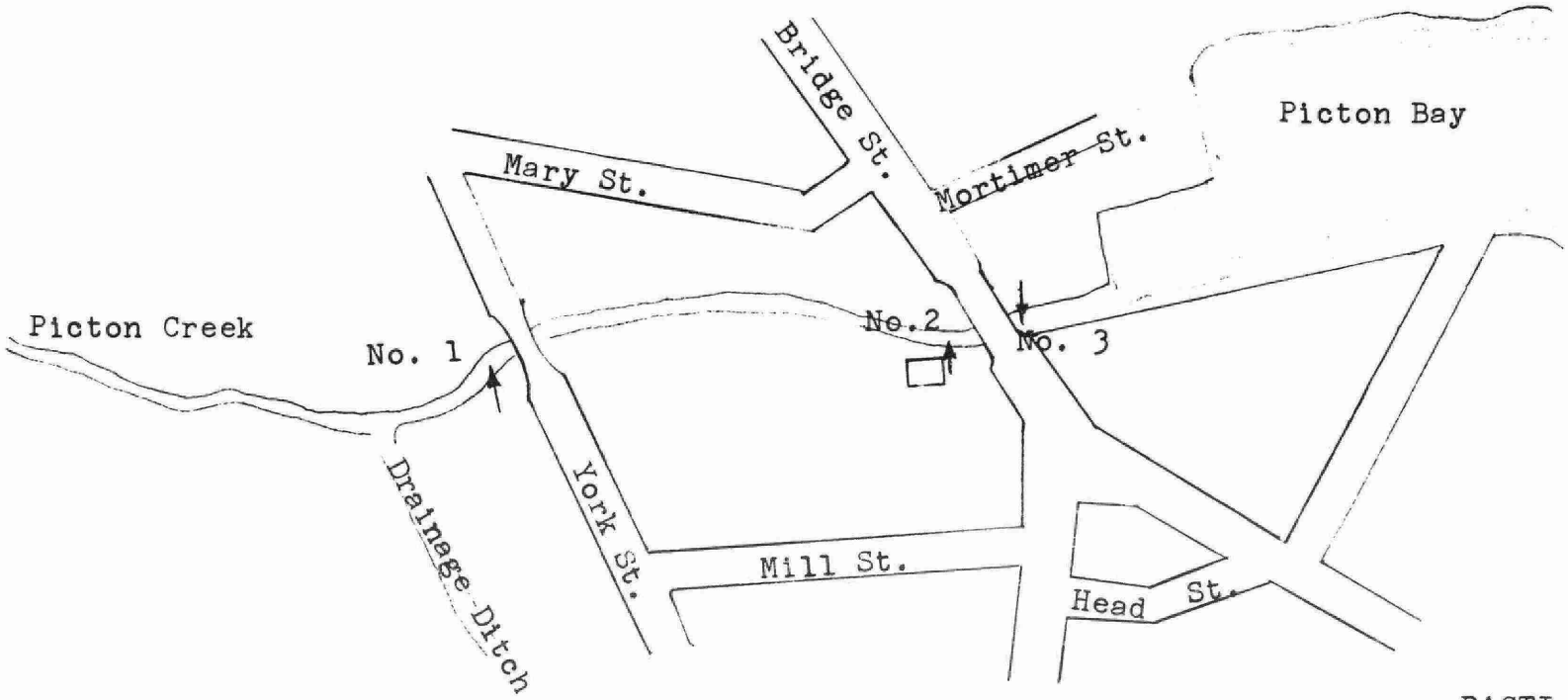
3) Bridge Street Pumping Station

This station receives over 70% of the flows from the town. Two Smart & Turner pumps rated at 400 gpm and 200 gpm respectively convey sewage from the station through an 8-inch forcemain to Head Street. Reportedly, overflows to Picton Creek occur for 30 to 35 days during the year with most being discharged during the spring. Based on this information, it was estimated that in the course of a year approximately 25 million gallons of sewage would be discharged directly to Picton Creek without receiving the benefit of any treatment.

In Diagram Two, the results of samples collected from the overflow and in Picton Creek are presented. Again it is evident the quality of water would be affected with the discharge from the pumping station. What makes the raw sewage discharge more significant is the fact that most of the solids would settle out immediately in the quiesant Bay after flowing through the creek. Rising sludge caused by denitrification, especially in

DIAGRAM TWO

DESCRIPTION OF THE SAMPLING POINTS SELECTED WHILE OVERFLOW OCCURING AT THE BRIDGE STREET PUMPING STATION



Sampling Point No.	Description	5-Day BOD	Susp. Solids	Chloride as Cl	Phenols in ppb	BACTI EXAMINATION Total Coliform Per 100 ml	Fecal Coliform per 100 ml
1	Picton Creek at York St.	5.5	15	24	6	80,000+	8,000+
2	Bridge St. Pumping Station overflow	44	150	53	40	80,000+	8,000+
3	Picton Creek at Bridge St.	11	70	30	9	80,000+	8,000+

the summer, confirms this fact. The writer will elaborate in greater detail on the quality of water in Picton Bay in the section titled "Pollution Survey".

Town officials realizing the detrimental effects of the overflows have authorized the firm of Totten Sims Hubicki and Associates Limited to proceed with the design of an adequate station and forcemain to the waste treatment plant. When the work is completed, based on the consultants recommendation, a marked improvement in the Bay especially in the confined area at Bridge Street should be noticed.

Sewage Flows

The sewage flows measured at the plant by a venturi tube are summarized in Table 4.

TABLE 4 - SEWAGE FLOWS AT THE TOWN OF PICTON WATER POLLUTION CONTROL CENTRE - 1970

Month	FLOWS - MILLION GALLONS		
	Total	Maximum Day	Average Day
January	23.812	1.050	0.916
February	28.860	1.271	1.031
March	31.736	1.164	1.024
April	26.352	1.426	0.878
May	20.519	1.302	0.855
June	17.533	0.782	0.626
July	18.832	1.315	0.649
August	16.909	0.759	0.545
September	14.388	0.577	0.480
October	15.219	0.613	0.491
November	18.086	1.030	0.603
December	21.624	0.919	0.721

Population served within municipality	4860
Population served outside municipality	40
Total population served	4900
Average day in year 0.735 M.G.	150 gpcd.
Peak Day 1.426 (March)	291 gpcd.
Average day in peak month 1.024 (March)	209 gpcd.
Change from 1969 Flow	11% decline

Year	Average Daily Flow
1967	0.83 M.G.D.
1968	0.84 M.G.D.
1969	0.83 M.G.D.
1970	0.74 M.G.D.

Although there was a recorded 11% decline in the average daily flows between 1970 and the previous three years, the writer believes that the meter is not operating properly and perhaps is the reason for this variation. The flow chart and totalizer recordings are definitely not synchronized which also points out the need for adjustments to the recording device.

In a report prepared by our Technical Advisory Services Branch in 1965 it was concluded that the present aeration tank capacities are sufficient to treat a considerably larger daily flow of sewage providing the air supply is increased to meet the process oxygen requirements. With the increased facilities, operation as a contact stabilization process should enable this plant to adequately treat average flows of approximately 1.0 M.G.D. (3).

When the pumping stations are equipped with adequate facilities thus eliminating most of the overflows, a substantial hydraulic loading at the plant will periodically occur. To cope with this extra flow and at the same time prevent a washout of the

solids, it may be necessary to provide only primary sedimentation with disinfection as the form of treatment. The 5-day BOD and suspended solids of the raw sewage during these peak flow periods will be approximately 50 ppm. Another possibility would be to construct a large equilization tank which would restore the large flows until they could be handled at the treatment plant. It should be noted that there is no primary sedimentation tank incorporated into the present treatment processes. Whatever alternative is selected, the facilities should be capable of preventing a discharge of raw sewage to Picton Creek or Picton Bay since the bay is very shallow, there is a considerable amount of recreational activity in the area and the water intake is down stream.

The unusual high sewage per capita flow of 150 gallons per day is presumed to occur because of:

a) illegal roof drain connections to the sanitary sewer
b) weeping tile are allowed to hook into the sanitary sewers
c) sewer systems, especially in the older sections of the town, are in need of repairs and reconstruction.

The firm of Totten Sims Hubicki and Associates have also been authorized to study and recommend measures necessary to obtain optimum use of the plant. With an increased air supply, full use of both sedimentation tanks, the present treatment facilities are capable of meeting the demands of the municipality until the year 1990.

Plant Efficiency

The average concentrations for 1970 of BOD and suspended solids in the plant influent were 199 ppm and 326 ppm respectively while the average concentrations of BOD and suspended solids in the effluent were 17 ppm and 14 ppm respectively. Therefore, the

average reduction in the BOD and suspended solids of the raw sewage was 91% and 96% respectively. This degree of treatment indicates that the processes are operating well.

Similar results to those above were achieved on June 25, 1970 when a 24 hour sampling program was conducted at the plant. At that time, treating a mean flow of 0.582 M.G.D. with an average raw sewage BOD and suspended solids concentration of 80 ppm and 95 ppm, the process attained a 89% removal of BOD and a 90% removal of suspended solids.

A complete summary of the 1970 sample results is attached (Table 5 and Table 6).

Since the chlorinator is usually set to achieve a residual of 1.5 ppm in the treated effluent, the coliform bacteria are usually reduced to less than 100 per 100 ml.

Phosphorus Removal

In view of the quality of water in Picton Bay and the point of discharge, the Town of Picton is expected to incorporate phosphorus removal equipment at the plant which would be capable of removing at least 80% from the incoming sewage. December 31, 1974 has been adopted as the final date for the initial commencement of operation of the facilities.

The OWRC, Division of Research, have carried out jar tests at the plant to determine the probable chemical and dosage which could effect the 80% phosphorus removal. These results are expected to be forthcoming.

Summary and Conclusions

Excessive infiltration often exceeds design standards thereby increasing the frequency and duration of overflow at the pumping stations. Reduction in infiltration in existing

sewers by means of repairs and reconstruction offer opportunities to reduce these overflows. In addition, progressive action taken by the municipality to provide added pumping capacity at the pumping stations will also result in a reduction of the incidents of bypassing. Samples obtained while overflows were occurring indicate that there would be a deterioration of the quality of water in Picton Bay.

In 1970, the recorded average daily flow was 0.735 MGD; however, there is reason to believe the meter may not be recording properly and this should be looked into by staff of Fisher and Porter (company who installed the flow measurement equipment).

The average reduction in the BOD and suspended solids during 1970 was 91% and 96% respectively. This indeed is very good treatment.

After the results of the test conducted by the OWRC, Division of Research, for nutrient removal have been finalized, the municipalities' consultant may be in a better position to proceed with the plans for the provision of nutrient removal facilities.

After an intensive review of the plant, it was concluded that with very few alterations the plant should be capable of treating average daily flows of 1.0 M.G.D. Such a flow is not expected until the year 1990 when the population is estimated to be 6298.

Staff have had many interesting discussions with Mr. Dingman centered around the optimum operation of all facilities. In view of the inflexibility of some components of the plant, e. g. full use of both clarifiers, the ingenuity of the operator is called upon many times during the year. The feasibility of

wasting sludge continuously, series operation of the digesters and the usefulness of a centrifuge will continue to be topics of discussion during the next inspection.

POLLUTION SURVEY

Introduction

A water pollution survey was performed throughout the Town of Picton on July 8, 1971 for the purpose of locating and recording existing or potential sources of pollution. This survey was also intended to be a follow up to the survey conducted by Ontario Water Resources Commission staff on September 29, and 30, 1965.

Recommendations of Previous Survey and Action Taken

A summary of the recommendations presented in the report prepared after the 1965 survey and the action taken since then is summarized herein:

1) Municipal officials should expedite their program of separating combined sewage flows to exclude contaminated flows from storm sewers in Picton.

   Many new storm sewers have been installed since September 1965 but there still is evidence that private residences discharge untreated wastes to the storm sewer drainage areas. This will be elaborated on in greater detail when the writer is discussing the results from the survey in 1971.

2) Attempts should be made to control the escape of leachate from the town dump to Picton Creek.

   Earnest attempts have been made by the town to operate the dump satisfactorily but the local swampy conditions continue to assist the access of leachate to Picton Creek. After receiving a report on the site by Mr. P. Davidson, Regional Engineer, Waste Management Branch, based on his inspection of July 12, 1971 the town have begun to assess the various alternatives open to them. Again the writer will discuss the

pollution aggravated by the dump and the recommendations presented by Mr. Davidson to ensure the operation of a proper sanitary landfill site.

3) The firm of Proctor-Silex (Proctor-Lewyt) should take the necessary steps to protect the quality of the local water course.

Proctor-Lewyt Ltd. is presently installing facilities that will treat metal plating and finishing wastewaters and will include ion-exchange equipment, batch treatment equipment for pH adjustment and metals precipitation and a filter to remove precipitated solids. These treatment facilities were to be operative by November 15, 1971.

Sampling Stations and Results

The points sampled in 1965 were resampled and the results are presented in Table 7. The bacteriological samples were analyzed at the Ontario Department of Health Laboratory in Kingston while the chemical samples were analyzed by the Ontario Water Resources Commission Laboratory at Highway 401 and Islington, Toronto. All analyses were conducted according to "Standard Methods". A brief review of the sampling stations and the results of the samples is as follows:

a) Sampling Station PCW - 0.56

This sampling station is located on the west branch of Picton Creek and most of the flow in the creek at this point would originate from runoff in the southerly section of the town. The relatively high fecal coliform bacteria presence suggests the discharge of untreated sanitary wastes.

b) Sampling Station PC - 0.60

The high bacteria counts are probably attributed to the discharge from the waste treatment plant serving the Ontario Department of Health Hospital Complex in Hallowell Township.

c) Sampling Station PC-0.30

Samples collected in Picton Creek at the centre of the sanitary landfill revealed that leachate from the landfill was certainly gaining access to the creek resulting in a serious degradation of the water. In addition, the flow was being restricted with debris scattered along the banks and the black murky appearance of the bottom muds was characteristic of decomposing organic matter. The release of nutrients from the sanitary landfill had resulted in a prolific growth of aquatic weeds of which cat-tails were the predominant species. In general the appearance of the creek was very unpleasant in the vicinity of the sanitary landfill.

d) Sample Station PC-0.18

A sample was taken just upstream of the waste treatment plant outfall to assess the effect of the discharge on the creek. The results at this station were typical of those obtained in the immediate vicinity of the landfill site.

e) Sample Station PC-0.15

Since the samples collected downstream of the waste treatment plant outfall continued to be similar to those upstream, it was concluded that the treated effluent was not affecting the quality of water in the creek significantly. In fact, the flow from the plant tended to keep the creek from becoming stagnant. It should be noted however that the water is polluted before reaching the outfall.

f) Sampling Station LOBQPB - 4.9

This station was the centre of controversy in 1971 when several complaints were received at the OWRC office related to floating mats of black sludge. Solids and materials from the waste treatment plants, sanitary landfill, and Bridge Street Pumping Station will settle immediately in this area because the flow is restricted in the Bay as opposed to the creek where it would tend to be much quicker. As the organic material starts to decompose and all the dissolved oxygen is used up, the micro-organisms begin to rely on chemical oxygen that is tied up with the nitrogen. Thus when the micro-organisms extract this oxygen from the nitrogen (nitrates) small nitrogen gas is released and it rises to the surface at times lifting large mats of black sludge. This phenomenon has been observed by residents in the town and the writer.

As stated previously, the municipality has requested their consultants to alleviate the pollution originating from the landfill site and pumping station.

g) Sampling Station LOBQPB - 4.86

The open drainage ditch running parallel to Main Street was sampled just before it terminated in the Bay. Again the high total coliform (56000 per 100 ml) and fecal coliform (700 per 100 ml) bacteria presence suggests that untreated domestic waste was being discharged to the ditch.

h) Sampling Station LOBQPB - 4.8

The extremely high 5-Day BOD, organic nitrogen and total phosphorus concentrations along with the 80,000+ total coliform and 8000+ fecal coliform bacteria counts per 100 ml indicate

that indeed untreated sanitary waste was being discharged to the drainage ditch on Head Street. When the sample was being collected on July 8, 1971 the white murky appearance and the odour also confirmed the fact that laundry waste and domestic waste was flowing in the ditch.

The remaining stations are located in Picton Bay and generally the results were satisfactory.

At the time of the survey, Proctor-Lewyt was on holidays consequently there was no flow in the drainage ditch which flows across Highway # 41 to Picton Bay.

The following stations were also not sampled because there was no flow in the particular drainage ditch or storm sewer:

Station	Description
PC - 0.15	Drainage Ditch flowing parallel to York Street.
LOBQPB - 4.8W	Storm Sewer Outfall behind County Buildings to Picton Bay
PC-0.0P	Private Sewer to Picton Creek

Sanitary Landfill

Similar to the 1965 survey, the sample results from the creek indicate excessive BOD, suspended solids, total nitrogen, total phosphorus and coliform content and substantiates the need for corrective measures. In a report on the landfill site prepared by Mr. P. Davidson, P. Eng., Waste Management Branch, several recommendations were presented related to isolation of the disposal area from the creek or alternatively finding a new landfill site. Reportedly the town's consultants are investigating the disposal area and will shortly be presenting their report to council.

Conclusions

As indicated by the sample results and observations, the sanitary landfill, pumping station overflow, and untreated domestic wastes discharged to the storm sewers and drainage ditches are impairing the quality of water in Picton Creek and Picton Bay. The Town of Picton municipal officials have taken a progressive approach to control these sources of pollution. Presently, the firm of Totten Sims Hubicki & Associates Ltd. are studying the sewerage system in an effort to eliminate the overflows and achieve maximum efficiency at the waste treatment plant. In addition, the firm has been authorized to investigate the sanitary landfill site and report on measures required to eliminate the pollution originating from the site. Action is still required however to prohibit the discharge of untreated wastes to the storm ditches and in this regard special attention should be focused on the Head Street area.

Proctor-Lewyt Ltd. are presently installing waste treatment facilities which should ensure a high quality of effluent.

RECOMMENDATIONS

1. As more connections are made to the water distribution system, consideration should be given to increasing the present storage capacity.
2. According to the OWRC Drinking Water Objectives, a minimum of 15 bacteriological samples should be collected each month from the distribution system. The Town of Picton Public Utilities Commission conscientiously collect a number of these samples each month and we anticipate that they will ensure that the suggested 15 are collected and submitted to the OWRC laboratory or the Department of Health laboratory in Kingston.
3. In-depth studies for alleviating excessive infiltration should be undertaken. In this regard, the weeping tile along with roof connections should not be allowed to hook into the sanitary sewer system.
4. To assist the operator in controlling the solids concentration in the "contact zone" and "reaeration zone" it is recommended that a centrifuge be acquired.
5. The organization and adoption of a plan to eliminate the discharge of untreated waste to the storm sewers and storm drainage ditches should be undertaken by the Town of Picton. Under the plan a house to house examination would be required and each link to the storm sewer system would then be proved out and systematically eliminated if required. Bacteriological sampling and dye testing to find the sources of pollution would assist during the investigation.

REPORT PREPARED BY:

Robt. A. Dunn

R. A. Dunn, P. Eng.,
Div. of Sanitary Engineering

RAD/lc

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2. Ontario Water Resources Commission; Report on the Municipal Water Works. Dated June 3 and October 3, 1967.
3. Ontario Water Resources Commission; Report on the Evaluation of the Control Stabilization Activated Sludge Treatment Process at the Picton Water Pollution Control Plant. Prepared by OWRC, Technical Advisory Services Branch 1965.
4. Ontario Water Resources Commission Approval Application. August 1971.
5. Davidson, P. E., "Landfill Waste Disposal Site Town of Picton". Department of Energy and Resources Management, Waste Management Branch, July 15, 1971.

TABLE FIVE

SAMPLE RESULTS OF RAW SEWAGE COLLECTED AT THE TOWN OF PICTON WATER POLLUTION CONTROL CENTRE-1970

Month	5-Day BOD	SOLIDS			PHOSPHORUS AS P		NITROGEN AS N			
		Total	Susp.	Diss.	Total	Sol.	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate
January	-	-	-	-	-	-	-	-	-	-
February	75	610	125	485	12.0	4.6	15.0	24.0	0.020	<0.10
March	90	540	70	470	5.0	2.0	7.5	12.0	0.060	0.02
April	180	1200	330	870	18.0	13.0	9.5	15.0	0.040	0.06
May	340	990	580	410	13.0	7.4	15.0	28.0	0.035	0.02
June	200	1480	360	1120	20.0	7.4	16.0	55.0	0.030	0.01
July	-	-	-	-	-	-	-	-	-	-
August	360	5590	4950 *	640	49.0	38.0	15.0	55.0	0.060	0.40
September	240	710	250	660	18.0	11.0	13.0	28.0	0.060	<0.10
October	110	2770	570	2200	40.0	23.0	12.0	40.0	0.010	<0.10
November	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-
Average	199	1761	326	857	21.9	13.3	12.9	32.1	0.050	-

* Excluded from Calculation

TABLE SIX

SAMPLE RESULTS OF TREATED SEWAGE COLLECTED AT THE TOWN OF PICTON WATER POLLUTION CONTROL CENTRE-1970

Month	5-Day BOD	SOLIDS			PHOSPHORUS AS P		NITROGEN AS N			
		Total	Susp.	Diss.	Total	Sol.	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate
January	-	-	-	-	-	-	-	-	-	-
February	28.0	450	35	415	6.4	2.9	11.0	14.0	0.22	1.0
March	6.0	440	10	430	2.4	1.7	3.5	5.5	0.10	2.8
April	7.5	450	5	445	3.2	0.7	4.5	5.0	0.18	1.6
May	18.0	410	10	400	2.4	2.0	0.5	1.1	0.87	7.5
June	7.0	430	5	425	6.2	6.0	1.5	3.4	0.06	4.6
July	-	-	-	-	-	-	-	-	-	-
August	13.0	490	5	485	5.5	4.9	13.0	17.0	0.32	3.2
September	46.0	420	15	405	7.4	7.0	<0.1	13.0	11.00	27.0
October	6.5	400	25	375	5.0	4.2	11.0	16.0	1.00	0.9
November	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-
Average	16.5	436	14	422	4.8	3.7	-	9.4	1.72	6.1

TABLE SEVEN

THE RESULTS OF BACTERIOLOGICAL AND CHEMICAL SAMPLES COLLECTED THROUGHOUT TOWN OF PICTON

PICTON CREEK AND PICTON BAY ON JULY 8, 1971

Sample Point Number	Description	5-Day BOD	SOLIDS			NITROGEN AS N				PHOSPHORUS AS P		BACTI EXAMINATION	
			Total	Susp.	Diss.	Ammonia	Total Kjeld -ahl	Nitrite	Nitrate	Total	Sol.	Total Coliforms per 100ml	Fecal Coliforms per 100ml
PCW-0.56	Picton Creek-west branch just downstream of cemetery pond	1.0	520	5	515	0.04**	0.35**	0.038**	2.6**	0.054**	0.008**	560	360
PC-0.60	Picton Creek at Grove St.	0.6	360	20	340	0.01	0.40	0.039	0.25	0.220	0.056	1600	300
PC-0.30	Picton Creek at Center of Town Dump	4.0	560	60	500	0.78	1.10	1.300	1.50	0.250	0.006	4600	1300
PC-0.18	Picton Creek Just Upstream of Waste Treatment Plant Outfall	7.0	730	50	680	0.15	3.80	0.160	0.23	0.330	0.009	13000	700
PC-0.15	Picton Creek Downstream of Waste Treatment Plant Outfall	5.0	500	20	480	0.25	3.40	0.260**	**	**	0.015	3600	40
LOBQPB-4.9	Picton Bay opposite mouth of Picton Creek	6.0	320	10	310	0.20	1.90	1.600	2.40	2.000	1.400	80000+	300
LOBQPB-4.86	Drainage Ditch opposite Mortimer Street	2.5	490	5	485	0.20	0.50	1.800	1.50	0.640	0.500	56000	700
LOBQPB-4.8D	Drainage Ditch on Head Street	340	570	50	520	66.00	69.00	0.042	0.04	17.000	14.000	80000+	8000+
LOBQPB-4.8	Picton Bay Opposite Johnston St.	-	-	-	-	-	-	-	-	-	-	1500	0
LOBQPB-4.2W	Picton Bay opposite Fairfield St.	-	-	-	-	-	-	-	-	-	-	520	0
LOBQPB-4.5	West Side Picton Bay opposite Hill St Pumping Station	-	-	-	-	-	-	-	-	-	-	180	12
LOBQPB-4.5	Centre of Picton Bay Opposite Hill St Pumping Station	-	-	-	-	-	-	-	-	-	-	130	8

TABLE SEVEN (continued)

Sample Point Number	Description	5-Day BOD	SOLIDS			NITROGEN AS N				PHOSPHORUS AS P		BACTI EXAMINATION	
			Total	Susp.	Diss.	Free Ammonia	Total Kjeld -ahl	Nitrite	Nitrate	Total	Sol.	Total Coliforms per100 ml	Fecal Coliform per 100ml
LOBQPB-4.3W	Picton Bay-west bank north boundary	1.0	220	5	215	0.08	0.42	0.008	0.04	0.036	0.009	35	2
LOBQPB-4.3C	Picton Bay-Centre North boundary	1.0	220	5	215	0.08	0.48	0.010	0.06	0.046	0.011	60	0
LOBQPB-4.3E	Picton Bay-East bank North Boundary	1.0	210	5	205	0.07	0.47	0.009	0.05	0.034	0.004	130	0

BACTERIOLOGICAL INDICATOR ORGANISMS

TOTAL COLIFORM organisms include a wide variety of bacteria ranging from the genus (group) Escherischia Coli (E. Coli), which originate mainly in the intestines of man and other warm blooded animals, to the genera Citrobacter and Enterobacter aerogenes. The latter genera are basically found in soil but are also present in feces in small numbers. The present of total coliforms in water may indicate soil run-off or, more important, less recent fecal pollution since organisms of the Enterobacter - Citrobacter groups tend to survive longer in water than do members of the Escherischia Coli group, and even to multiply when suitable environmental conditions exist.

The FECAL COLIFORM organisms are those coliform bacteria which are of intestinal origin and, therefore, are an indicator of recent fecal pollution. Most of the coliform bacteria found by the fecal coliform test are of the genus Escherichia Coli.

FECAL STREPTOCOCCI organisms are normal inhabitants of the large intestine of man and animals and generally do not multiply outside the human body. In waters polluted with fecal material, fecal streptococci are usually found along with fecal coliform bacteria but in smaller numbers. When the number of fecal streptococci bacteria approximates or is greater than the number of fecal coliform organisms, animals are the probable source.

Total Plate

The OWRC Guidelines and Criteria for Water Quality Management in Ontario (1970) indicate that water used for total body contact recreation can be considered impaired when the total coliform, fecal coliform, and/or fecal streptococcus geometric mean density exceeds 1000,100, and/or 20 per 100 ml, respectively.

NOTE: The term "geometric mean" refers to a type of average. Mathematically speaking, the geometric mean of a set of N. numbers is the Nth root of the product of the numbers; in practice, it is computed by the use of logarithms.

SIGNIFICANCE OF CHEMICAL ANALYSES

Biochemical Oxygen Demand is reported in parts per million (PPM) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test required five days, under the controlled incubation temperature of 20°Centrigrade.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

Solids

The value of solids, expressed in parts per million, is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams and injury to the habitat of fish.

Nitrogen

Ammonia Nitrogen is sometimes called free ammonia is the insoluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03 ppm; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens.

The Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrite Nitrogen

Nitrite is usually an intermediate oxidation of ammonia, The significance of nitrites, therefore, varies with their amount, sources, and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrite present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousands of a part per million is generally indicative of active biological processes in the water.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide: low less than 0.1 ppm; moderate 0.1 to 1.0 ppm; high greater than 1.0 ppm.

Phosphorus

This element is commonly found in nature in the form of phosphates (PO_4). Raw or treated sewage, some industrial wastes, and agricultural drainage contain significant concentrations of phosphates, The laboratory provides two phosphorus determinations:

total phosphorus and soluble phosphorus. Total phosphorus includes orthophosphate, polyphosphate and organic phosphorus, while soluble phosphorus represents orthophosphates only.

Phosphorus is an essential nutrient for plant life and like nitrogen passes through cycles of decomposition and photosynthesis. Nitrogen and phosphorus are both essential for the growth of algae and limitation of these compounds controls their rate of growth.

Generally, soluble phosphorus in concentrations of 0.01 ppm or greater at the beginning of the growing season may cause algal nuisance conditions.

Anionic Detergents as ABS

The presence of anionic detergents as ABS is an indication that domestic waste is present.

Phenols

The presence of phenol or phenolic equivalents is generally associated with discharges containing petroleum products, or with wastes from some industries. It is generally conceded that adequate protection of surface waters will be provided if the concentration of phenols in waste discharges does not exceed 20 parts per billion (ppb). Phenolic type waste can cause objectionable conditions in water supplies and might taint the flesh of fish.

Iron

Water for domestic use should contain less than 0.3 parts per million of iron in order to avoid objectionable tastes, staining and sediment formation. Iron concentrations of not greater than 17 parts per million in waste discharges should permit adequate protection of surface waters.

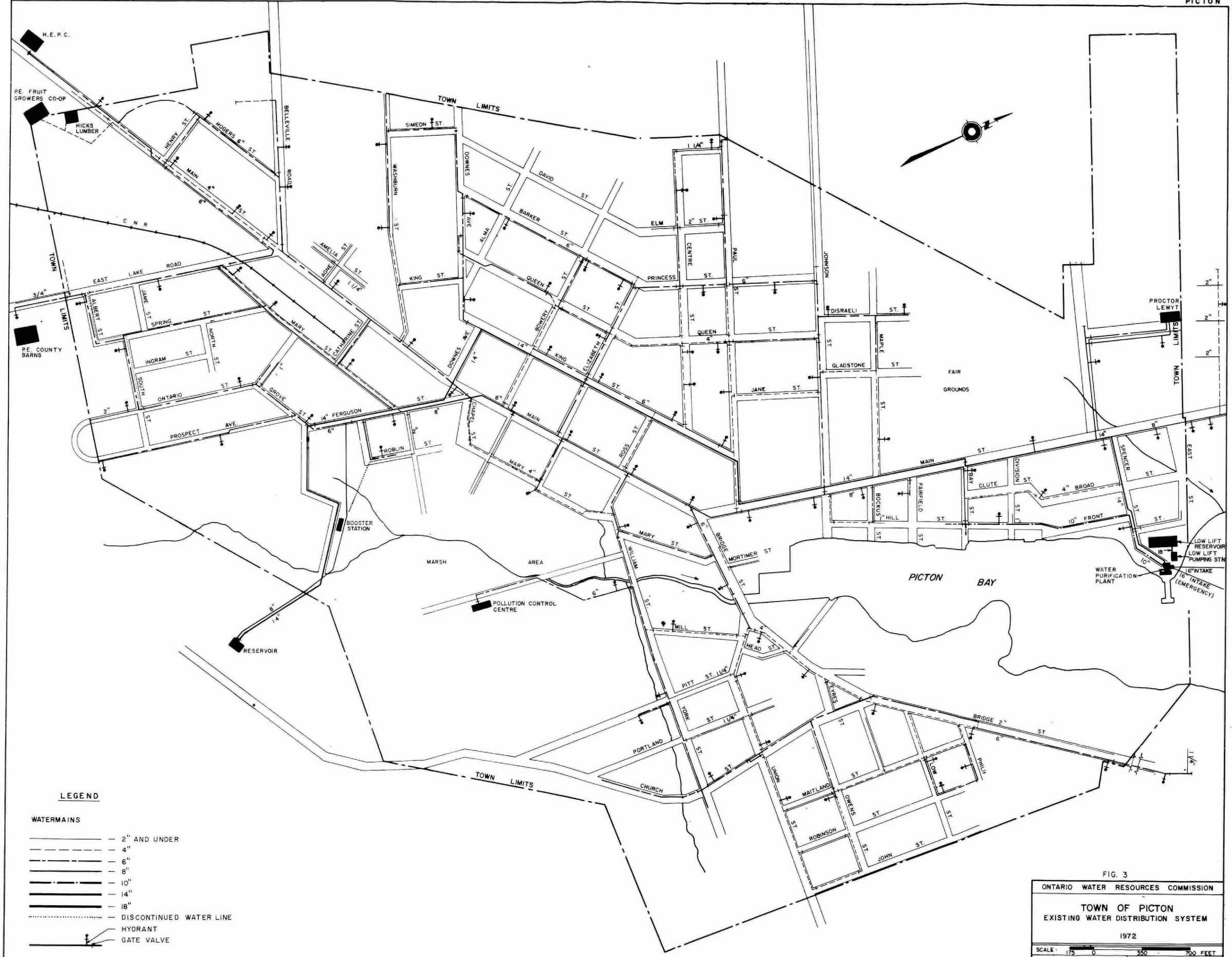


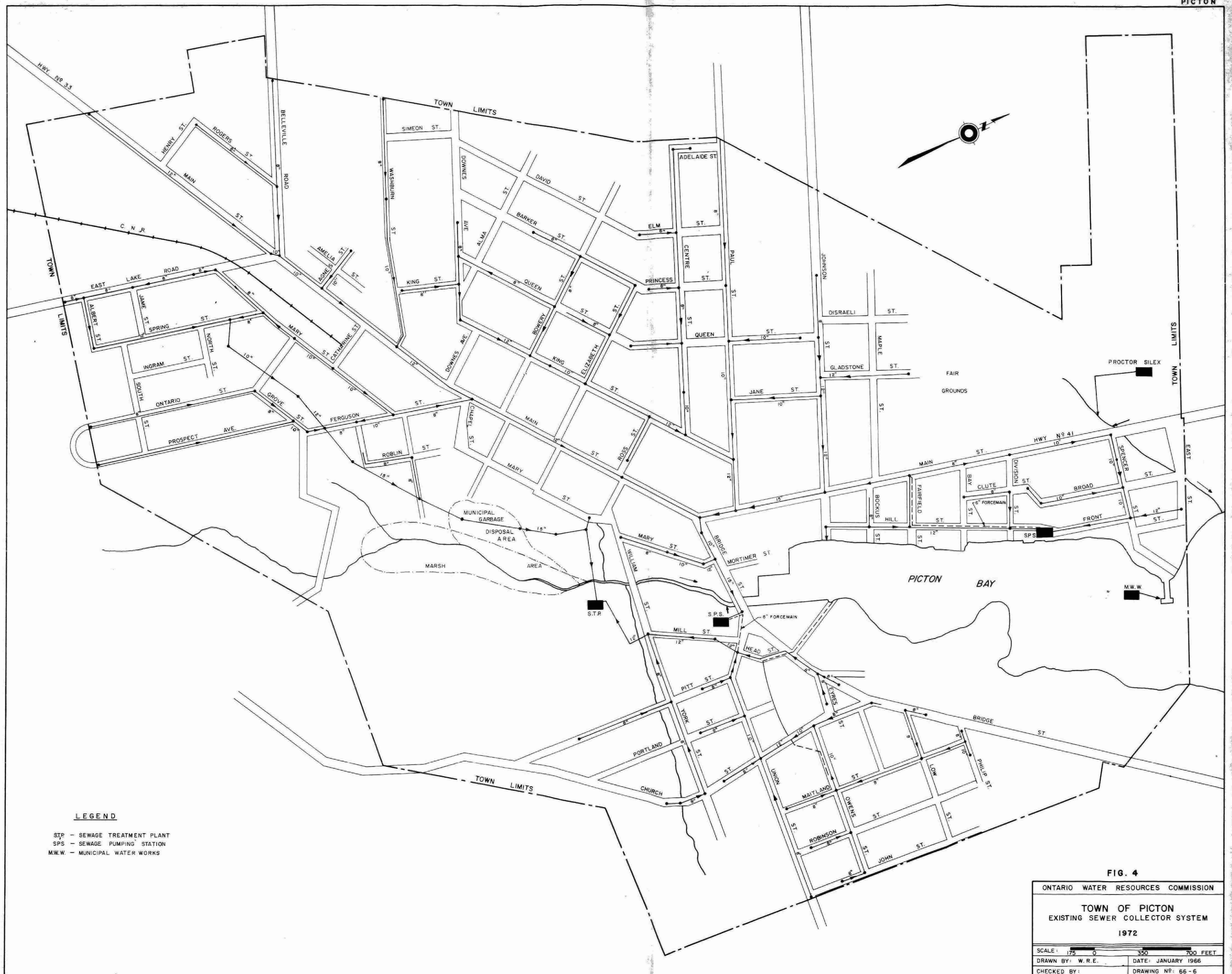
FIG. 3

ONTARIO WATER RESOURCES COMMISSION

TOWN OF PICTON
EXISTING WATER DISTRIBUTION SYSTEM
1972

SCALE: 175 0 350 700 FEET	
DRAWN BY: W.R.E.	DATE: JANUARY 1966
CHECKED BY:	DRAWING Nº 66-6

PICTON

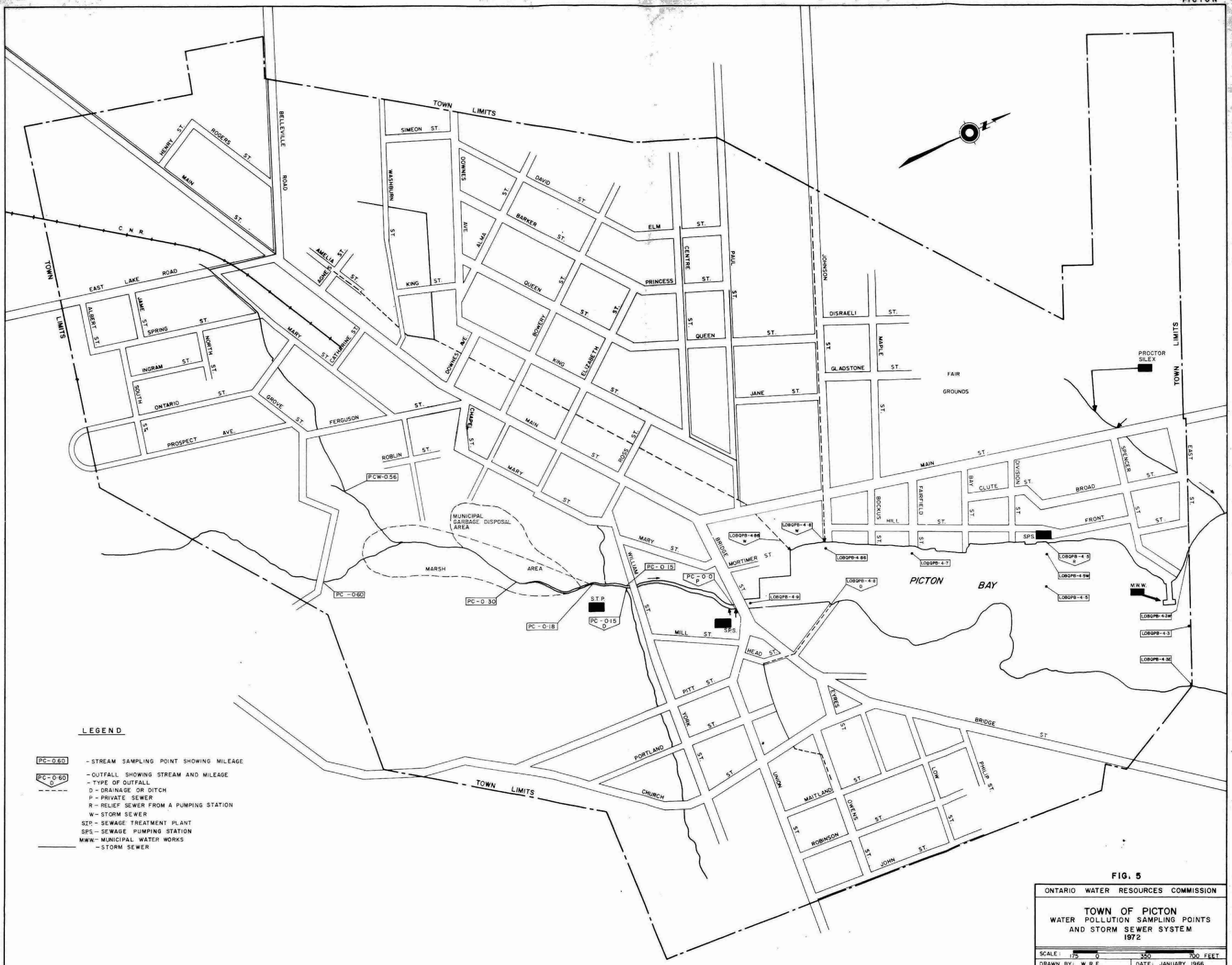


LEGEND

STP – SEWAGE TREATMENT PLANT
SPS – SEWAGE PUMPING STATION
M.W.W. – MUNICIPAL WATER WORKS

FIG. 4

ONTARIO WATER RESOURCES COMMISSION	
TOWN OF PICTON EXISTING SEWER COLLECTOR SYSTEM 1972	
SCALE: 175 0 350 700 FEET	
DRAWN BY: W.R.E.	DATE: JANUARY 1966
CHECKED BY:	DRAWING Nº: 66-6



LEGEND

PC-0.60 - STREAM SAMPLING POINT SHOWING MILEAGE

PC-0.60 D - OUTFALL SHOWING STREAM AND MILEAGE
- TYPE OF OUTFALL
D - DRAINAGE OR DITCH
P - PRIVATE SEWER
R - RELIEF SEWER FROM A PUMPING STATION
W - STORM SEWER

STP - SEWAGE TREATMENT PLANT
SPS - SEWAGE PUMPING STATION
MWW - MUNICIPAL WATER WORKS
——— - STORM SEWER

FIG. 5

ONTARIO WATER RESOURCES COMMISSION

TOWN OF PICTON
WATER POLLUTION SAMPLING POINTS
AND STORM SEWER SYSTEM
1972

SCALE: 175 0 350 700 FEET	
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